# Partial Retirement Opportunities and the Labor Supply of Older Individuals*

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**Abstract**

We evaluate partial retirement options as a tool to increase labor participation among older individuals. In a stated choice experiment, Dutch survey respondents were asked to choose among early, late and partial retirement scenarios purged from restrictions on part-time and gradual retirement. Retirement scenario characteristics were randomized, generating rich variation in the choice options. The stated choices are validated using revealed preference data on (planned) retirement decisions. Using the stated choice data, we estimate a model that makes the trade-offs between leisure and income over the life cycle explicit, and use the estimated model for counterfactual policy simulations. We find that, as expected, a higher statutory retirement age makes actuarially fair (abrupt) early retirement more attractive and makes late retirement less attractive, while for any statutory retirement age, about one in three respondents prefer partial retirement. The partial retirement decision is sensitive to financial incentives, such as the wage rate during partial retirement or subsidized partial retirement. Early retirement becomes more attractive than late retirement when individuals do not have the partial retirement option, demonstrating the potential of partial retirement as a policy instrument to stimulate labor participation, especially when the statutory retirement age is increased.

## 1 Introduction

Many countries take policy measures to prolong working lives. The main measure is increasing the statutory retirement age. A higher statutory retirement age implies higher labor participation among older people, a longer period of tax and social security contributions, and a shorter

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period of pension claims. However, not everyone will be willing or able to work full-time until the higher state pension age. Some may retire and claim an early occupational pension or use their accumulated non-pension wealth, but others may want to continue working a reduced number of hours and combine part-time earnings with a partial pension.

The most common retirement scenario is an abrupt transition from a full-time job into full retirement, also referred to as abrupt or cliff-edge retirement (Vickerstaff et al., 2003), at the statutory (or normal) retirement age. Existing studies show that mandatory retirement and program incentives in public and private pension schemes induce individuals to retire at this age (Stock and Wise, 1990; Blau, 1994; Rust and Phelan, 1997; Coile and Gruber, 2007; Atav et al., 2023). Moreover, restrictions imposed by employers often limit the workers' opportunities to reduce their work hours in a gradual manner before withdrawing completely from the labor market, e.g. due to fixed costs per worker, difficulties to organize part-time work schedules or a negative attitude towards older workers (Hutchens, 2010; Rogerson and Wallenius, 2013). In other words, institutional regulations and restrictions limit older workers' opportunities for alternative retirement trajectories that would allow an optimal combination of work, leisure, income and consumption over the life cycle. This also limits the scope of policy reforms aimed at financial incentives to increase labor market participation among older age groups.

In a partial retirement scenario, employees gradually reduce their work hours or change to a less demanding job with usually lower earnings before they completely leave the labor market. Partial retirement has gained importance over time as an alternative to abrupt retirement or a switch to self-employment with flexible work hours (Bloemen et al., 2016; Parker and Rougier, 2007).

Partial retirement programs have several potential advantages. First, they allow employees to gradually adjust and smooth leisure and consumption over the life cycle in line with the predictions of standard labor supply models (Ameriks et al., 2020). Those who would like to work less can combine part-time earnings with a partial pension, especially since early claiming of a full pension can reduce the pension substantially (Kantarcı et al., 2013). Second, partial retirement allows employers to retain people with precious skills that are difficult to replace (Hutchens, 2010). Third, partial retirement may extend employment years by facilitating work after the statutory retirement age or by restraining early withdrawal from the labor market, for example for employees with demanding occupations (Vermeer et al., 2016). This implies extending pension contribution periods and reducing years of claiming full benefits, which helps to sustain the pension system. This also seems to be the main reason why many countries consider ways to remove impediments to partial retirement, as part of a package of policy measures to increase retirement flexibility.

Many employees state an interest in working part-time before retirement. According to US survey data from 2015, about 60% of nonworking respondents would be willing to return to work if they could choose the number of hours worked instead of having to work the same number of hours as in their last job, and 20% of them would be willing to accept a 20% hourly wage reduction to do so (Ameriks et al., 2020). Figure 1 analyzes Dutch individuals in paid employment who are asked to state whether they want to work more hours, fewer hours, or the same number of hours they work now. The figure distinguishes four age categories and shows the fraction of respondents who want to work fewer hours over 15 years. The fraction is very stable over the observation period for all age groups except that the oldest age group shows a notable increase from the year 2013. This is the year when the state pension eligibility age started increasing, suggesting that individuals want to work fewer hours as their state pension eligibility age is delayed beyond age 65.

The economics literature explains the labor supply behavior of older workers in a life cycle framework, where workers choose the optimal combination of work, leisure, income and

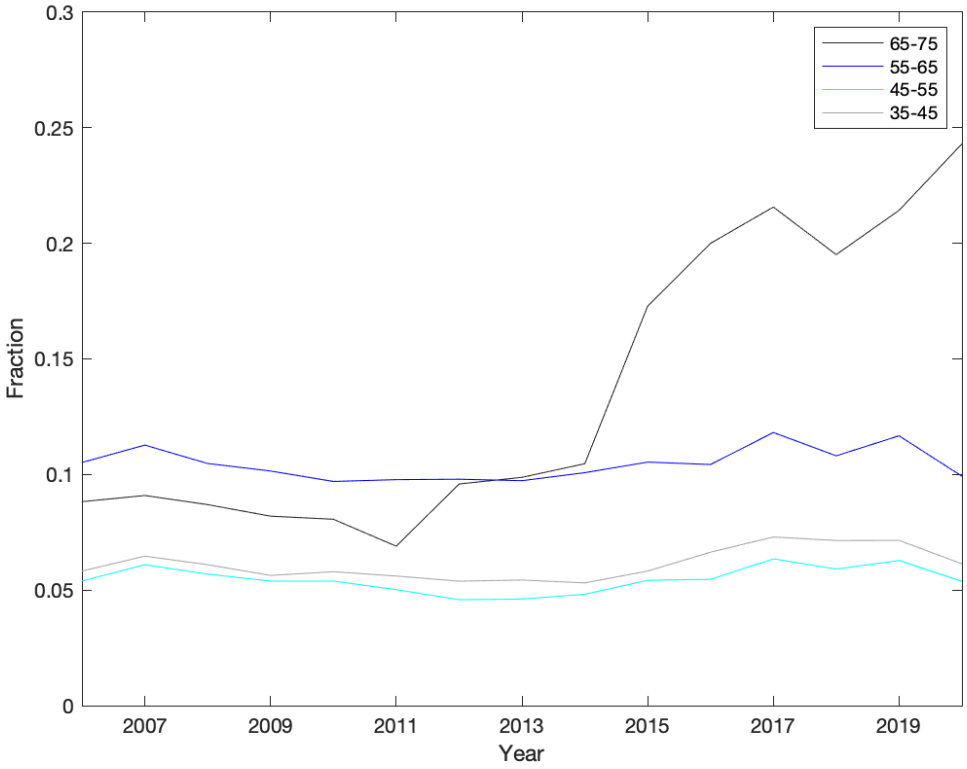



Figure 1: Fraction of employees who want to work fewer hours in employees who want to work more hours, fewer hours or continue to work the same number of hours by age and year. Source: Labor Force Survey of Statistics Netherlands.

consumption, taking account of the future by maximizing expected utility over the life cycle (Lazear, 1987; Hurd, 1990; Lumsdaine and Mitchell, 1999; Rogerson and Wallenius, 2013). Models explaining retirement decisions are usually estimated using data on actual retirement (Stock and Wise, 1990; Rust and Phelan, 1997; French, 2005; Van der Klaauw and Wolpin, 2008). From such data, however, it is often difficult to identify an individual's available retirement options in detail. This particularly applies to partial retirement plans, since it is often unclear whether an employer offers such a plan, and, if so, which trajectory of earnings and pension incomes it implies. Indeed, partial retirement arrangements are often informal agreements negotiated between employer and employee (Hutchens, 2010). A comparison of survey data on actual and preferred working hours shows that older workers often want to work part-time, but actually work full-time or not at all, suggesting that data on actual work hours substantially underestimate preferences for partial retirement (Ameriks et al., 2020).

To analyze preferences for partial and full retirement while accounting for restrictions on part-time work or gradual retirement, we draw on stated choice data, following several earlier studies like Ameriks et al. (2020), Van Soest and Vonkova (2014), Elsayed et al. (2018), and Michaud et al. (2020). As argued by Louviere et al. (2000), such data can capture a wider and broader array of preference-driven behaviors than data on actual behavior, allowing for choice opportunities that do not yet exist in the market. This also applies to our study: we analyze retirement plans that do not yet exist or are not available to many workers.

Our survey was fielded in the Longitudinal Internet Survey for the Social Sciences (LISS)

panel in 2017. We presented choice sets of hypothetical full and partial retirement plans, irrespective of whether the respondent's own employer actually offered partial retirement or not. Each retirement plan has its own income trajectory. The labor market states considered are working full-time, working part-time with a partial pension, and full retirement; alternative exit routes such as unemployment or disability do not play a role. To choose their favorite plan, respondents trade-off between working more hours or more years with a higher pension versus working less with a lower pension. Respondents are randomly assigned to different amounts of pension income and ages of retirement in the hypothetical retirement plans. We vary pension income levels, either changing rewards for later retirement (changing the price effect of pensions), or changing the overall generosity irrespective of the retirement age (changing the wealth effect of pensions). We also vary the wage rate during partial retirement and duration of partial retirement. We then estimate a structural model to analyze individuals' decisions to work full-time or (gradually) retire and conduct several policy simulations, e.g. aimed at stimulating partial retirement.

We make several contributions to the literature. First, Van Soest and Vonkova (2014) conduct a stated choice experiment and estimate a structural model to analyze the impact of pension incentives on retirement decisions, including partial retirement. Like Van Soest and Vonkova, we estimate a structural model. We use more recent data, exploit more systematic and richer variation in choice options, and explore much richer aspects of partial retirement. More importantly, we designed the stated choice experiment accounting for the actuarial rules of the Dutch pension system. Making the survey realistic is important because surveys are not only a way of collecting data, but they involve creating the process that generates the data (Stantcheva, 2023). The more realistic is the hypothetical market setting, the more likely that stated choice behavior look like real choice behavior (McFadden, 1998). Moreover, as the value of the stated choice data depends on whether they are predictive of real behavior, we validate the stated choices using revealed preference data: We show that estimated labor supply preferences correlate in plausible ways with, among others, peoples' actual or predicted retirement plans and with a subjective question on whether respondents value work just for money or for its intrinsic value.

Second, we focus on preferences for partial retirement versus abrupt retirement at, for example, the public pension eligibility age. We find that, at any given age from 60 to 66, more than one in three respondents prefer partial retirement over early or late abrupt retirement, showing a preference for a smooth life-cycle profile of leisure and consumption and implying a low intertemporal elasticity of substitution for many individuals (Ameriks et al., 2020). It also points at restrictions that hamper partial retirement in revealed preference data (Rogerson and Wallenius, 2013). We also consider how individuals value the characteristics of a partial retirement plan, showing, for example, that they often prefer half time work during partial retirement instead of less or more hours.

Third, partial retirement schemes can stimulate labor participation if older individuals more often use them to substitute full retirement than full-time work. We show that early retirement becomes more attractive than late retirement when individuals do not have the partial retirement option, especially when the statutory retirement age increases. This demonstrates the potential of partial retirement as a policy instrument to stimulate older individuals to remain active in the labor force. This is in line with Ameriks et al. (2020) who find that in the US, older individuals would work longer if they had opportunities to work in jobs that would allow them to choose how much to work.

Finally, we contribute to the literature analyzing the sensitivity of retirement decisions to financial incentives. We disentangle and investigate the effects of pension wealth and pension accruals. We study these effects both at the extensive and intensive margin while many earlier

studies consider retirement as a binary outcome (Van der Klaauw and Wolpin, 2008; Danzer, 2013; Atalay and Barrett, 2015; Delavande and Rohwedder, 2017). We also evaluate the effects of subsidized partial retirement programs that mimic plans recently introduced in the Netherlands. We find that the partial retirement decision is sensitive to pension accruals but not to pension wealth, and subsidies make partial retirement much more attractive and can be an effective tool to increase labor participation of older workers.

This paper proceeds as follows. Section 2 describes the Dutch pension system. Section 3 describes the stated choice experiment. Section 4 describes the data and presents descriptive statistics. Section 5 presents the model and the estimation method. Section 6 presents the estimation results and section 7 conducts policy simulations. Section 8 concludes.

## 2 The Dutch pension system

Retirement income in the Netherlands mainly stands on two main pillars: the state pension and the occupational pension.[1] The General Old-Age Pensions Act (AOW) is the state pension scheme, paying a flat-rate benefit when people reach the state pension age, independent of earnings, income or premiums paid. The benefit level depends on the number of years of residence in the country and on household composition. For those who always resided in the country, it provides households older than the statutory retirement age with a subsistence-level income. The scheme is unfunded and based on the pay-as-you-go principle: current state pensions are financed from the current premiums paid by workers. The premiums are paid through income tax. The statutory retirement age was fixed at age 65 for many years, until birth cohorts reaching age 65 in 2013. Since then, it is gradually delayed to, for example, age 67 for those born between March 1 1957 and December 31 1959. It will be age 67 and three months for those born in 1962 and will be delayed further in the long run, with eight months for each additional year of life expectancy. It does not allow flexible claiming of pension rights.

Participation in the fully funded occupational pension scheme is mandatory for almost all employees. The scheme is essentially individual, but incorporates a widow(er) and orphan provisions. From the early 1990s until 2005, many employees with an occupation pension scheme could benefit from generous early retirement arrangements (VUT), allowing them to retire much earlier than the state pension age without any reduction in life-cycle income, which made early retirement a very common option. These arrangements were slowly phased out since 2006 when a tax reform (RVU) essentially made them very unattractive. Today many occupational pension funds do allow maximum flexibility, allowing for early, late or partial retirement and pension claiming, but with actuarially fair trade-offs and a fair price for retiring early or working longer. As a consequence, the average retirement age rose from 61 in the early 2000s to almost age 65 in the late 2010s.[2]

The rising state pension eligibility age and the disappearance of generous early retirement schemes hampered early retirement for many older workers, including those with health issues and/or demanding occupations. In response, employer and employee organizations agreed upon new arrangements that subsidized partial retirement schemes. These were introduced in collective labor agreements in the late 2010s, allowing employees to work fewer hours in the years before reaching their statutory retirement age with a less than proportional decrease in salary and a pension accrual based on full-time salary (see, e.g., Rutten et al., 2023). Details differ by sector; an example is the 60/70/100 arrangement: work 40% less than full-time, receive 70% of the full-time wage, and accumulate occupational pension rights as if working full-time.

[1] The third pillar is private pension savings and its share in retirement income is much smaller.
[2] Source: Statistics Netherlands, Pensioenleeftijd in 2021 ruim 4 jaar hoger dan in 2006 (cbs.nl).

## 3 The stated choice experiment

The survey consists of two main parts. The first has questions on background characteristics and aspects of work and social life. The second aims at measuring preferences for abrupt and partial retirement. Prior to the second part, an instructions page is presented where the layout of the retirement scenarios is described in detail – see Figure 10 in the Appendix. Several stated choice questions are asked, inviting respondents to make trade-offs between working more with a higher pension versus working less with a lower pension. Figure 2 shows an example. It starts with a short introduction and then briefly describes three retirement scenarios, followed by a timeline giving the number of hours worked and the earnings and pension income at each age. Respondents are asked to choose their favorite retirement scenario among the three, based upon their own preferences. Each retirement scenario is characterized by several attributes: the ages of partial and full retirement, the number of hours worked during partial retirement, the wage rate when working full-time or part-time, and pension income during partial and/or full retirement (determined by replacement rates).

Each retirement scenario takes the form of a vignette: a short description of a hypothetical situation. Vignettes have been used for a long time in the social sciences and more recently also in economics, see, e.g., Van Beek et al. (1997) for an early example. We use hypothetical people so that respondents for whom the retirement scenarios seem unrealistic can still answer the questions. For example, unemployed or disabled workers are often reluctant to respond if asked to imagine they have a permanent job until retirement age but will take it less personal if asked to evaluate a hypothetical persons retirement plan.

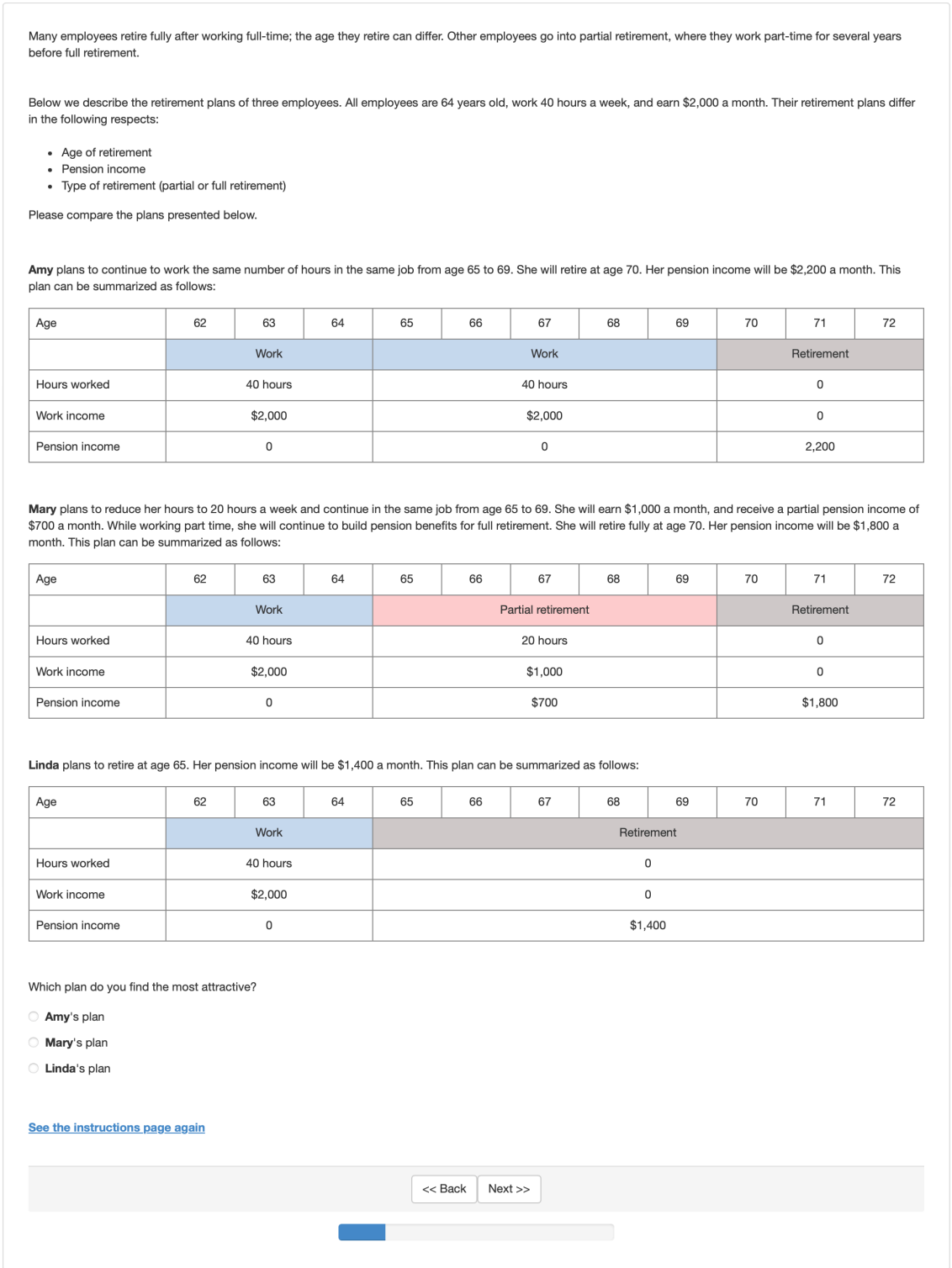
Each respondent got three choice questions like the one depicted in Figure 2, varying some of the attributes for each of the scenarios the respondent could choose. Questions 1, 2 and 3 use age 65, age 63 and 61 as the age of early or partial retirement, respectively. Moreover, to increase experimental variation, some attributes were varied randomly across respondents: pension income (i.e., the replacement rate), earnings (or the wage rate) during partial retirement, and the duration of partial retirement; see Table 5 in the appendix for details.

Earnings when working full-time of the vignette persons are based upon the respondents actual earnings in the current or last job, asked in a question on last or current earnings in part one of the survey. This is done to bring the standard of living of the vignette persons in the same range at the standard of living of the respondent, making it easier for the respondent to decide what he or she would do in the vignette persons situation.[3] On the other hand, the age at which the hypothetical employee retires partially or fully is independent of the respondents own employment situation, age (at the time of the survey), or other characteristics. The hypothetical employee works 40 hours a week during full-time work and 20 hours a week during partial retirement. Since the questions are about hypothetical people, they can be answered even by respondents who do not work and do not intend to work in the future, e.g. due to permanent disability.

Several studies showed that labor market rigidities force employees to partially retire outside their main job for a lower hourly wage rate, due to, e.g., a part-time wage penalty or due to switching to a less demanding job (Hutchens, 2010; Aaronson and French, 2004; Ameriks et al., 2020). To investigate how individuals value partial retirement associated with a reduced wage rate, we also use scenarios where the wage rate in partial retirement is 20% lower than the wage rate in the old full-time job ("partial retirement in the narrow definition; see Section 1).

We randomly vary the duration of partial retirement between four years and five years. In the former case, full retirement comes earlier, and in accordance with the assumed actuarial fairness, replacement rates during full retirement are somewhat lower.

[3]It avoids alienation bias; see, e.g., Hanemann (1994); Whittington (2002).



Many employees retire fully after working full-time; the age they retire can differ. Other employees go into partial retirement, where they work part-time for several years before full retirement.

Below we describe the retirement plans of three employees. All employees are 64 years old, work 40 hours a week, and earn $2,000 a month. Their retirement plans differ in the following respects:

- Age of retirement
- Pension income
- Type of retirement (partial or full retirement)

Please compare the plans presented below.

**Amy** plans to continue to work the same number of hours in the same job from age 65 to 69. She will retire at age 70. Her pension income will be $2,200 a month. This plan can be summarized as follows:

| Age | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Work | | | Work | | | | | Retirement | | |
| Hours worked | 40 hours | | | 40 hours | | | | | 0 | | |
| Work income | $2,000 | | | $2,000 | | | | | 0 | | |
| Pension income | 0 | | | 0 | | | | | 2,200 | | |

**Mary** plans to reduce her hours to 20 hours a week and continue in the same job from age 65 to 69. She will earn $1,000 a month, and receive a partial pension income of $700 a month. While working part time, she will continue to build pension benefits for full retirement. She will retire fully at age 70. Her pension income will be $1,800 a month. This plan can be summarized as follows:

| Age | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Work | | | Partial retirement | | | | | Retirement | | |
| Hours worked | 40 hours | | | 20 hours | | | | | 0 | | |
| Work income | $2,000 | | | $1,000 | | | | | 0 | | |
| Pension income | 0 | | | $700 | | | | | $1,800 | | |

**Linda** plans to retire at age 65. Her pension income will be $1,400 a month. This plan can be summarized as follows:

| Age | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Work | | | Retirement | | | | | | | |
| Hours worked | 40 hours | | | 0 | | | | | | | |
| Work income | $2,000 | | | 0 | | | | | | | |
| Pension income | 0 | | | $1,400 | | | | | | | |

Which plan do you find the most attractive?

- **Amy**'s plan
- **Mary**'s plan
- **Linda**'s plan

See the instructions page again

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Figure 2: The stated preference question asking to choose among early, partial and late retirement.

Pension income is computed from earnings, using a given (net) replacement rate. Pension and work income are presented in absolute amounts (rather than replacement rates). To increase experimental variation, replacement rates are randomized across respondents. In most cases the replacement rates are lower than the actual benchmark replacement rates in full and partial retirement computed by Kantarcı et al. (2013) since the latter do not account for career gaps and jobs that do not have automatic pension savings. For example, in the case of abrupt retirement at age 65, the benchmark net replacement rate we use is 70%, but we also show scenarios with replacement rates 60% and 80%.

We use choice sets in which all three scenarios someone can choose have higher or lower replacement rates than the benchmark, but we also use choice sets where the rewards for retiring later (the accruals) are higher or lower than the actuarially fair benchmark accruals. While the former directly aims at analyzing the effect of overall pension generosity (the pension wealth effect), the latter aims at analyzing the effect of a change in the price of life-time leisure (a price effect).

We asked several follow-up questions if respondents chose the partial retirement scenario in the three questions on the choice between early, partial or late retirement. First, we asked them to choose between early and late (abrupt) retirement only (the second best option). Second, we asked them to choose among partial retirement scenarios with working hours 12, 20, and 28 hours per week during partial retirement (where more hours of work come with higher earnings and lower pensions during partial retirement, and higher pensions during full retirement; see Table 6 in the appendix for details). Third, we asked to choose between two scenarios with partial retirement: one with 20 hours of work per week during partial retirement for four years, the other one with 20 hours of work for two years, and 10 hours in the subsequent two years (with adjusted earnings and (actuarially fair) pensions; see Appendix Table 7).

All in all, each respondent got between three and eight stated choice questions, depending on how often the respondent chose partial retirement and therefore on how many follow-up questions were asked. Table 1 presents the values of all the attributes used in any of these questions.

Table 1: Attribute values used in the vignettes

| Attribute | Values |
|---|---|
| Early retirement age | 61, 63, 65 |
| Partial retirement age range | 61-64, 63-66, 65-68, 61-65, 63-67, 65-69 |
| Late retirement age | 65, 66, 67, 68, 69, 70 |
| Replacement rate during partial retirement (% of foregone earnings) | 5, 10, 15, . . . , 65, 70 |
| Replacement rate during full retirement (% of foregone (full-time) earnings) | 40, 45, 50, . . . , 105, 110, 120, 130 |
| Hours worked per week during partial retirement | 10, 12, 20, 28 |
| Steps in which work hours are reduced | No partial retirement, partial retirement is 20 hours per week, partial retirement is first 20 and later 10 hours of work per week |
| Full-time net monthly earnings | 1000, 1500, . . . , 10,000 (based upon respondents' net earnings in current or last job) |
| Wage rate during partial retirement | 100% or 80% of full-time wage rate |

The variation of the scenario attributes within and across respondents makes it possible to estimate a model in which respondents maximize their lifetime utility, which depends on leisure and income in each year after age 60 (and therefore varies with the attributes of each scenario the respondent can choose). See Section 5.

# 4 Data

The survey was fielded in 2017 in the Longitudinal Internet Studies for the Social Sciences (LISS) panel administered by Centerdata at Tilburg University in the Netherlands. The LISS panel is based on a true probability sample of households drawn from the population register, covering the Dutch non-institutionalized population. It consists of approximately 5,000 households comprising 8,000 individuals who participate in monthly Internet surveys of about 15 to 30 minutes in total, and are paid for each completed survey. Households that could not otherwise participate are provided with a computer and Internet connection. An annual longitudinal core survey covers a large variety of topics including work, education, income, housing, time use, political views, values and personality. Our specific one-time survey was administered only to respondents aged 40 and older, generating 3,263 responses.

Table 2 presents figures on the sample composition. More than half are 60 years of age or older. About one third have higher vocational education or a university degree. Most are married or living together with a partner, and own the house they live in. More than one third are working for an employer, and about one third are retired. About half of the sample earn a net monthly income of 1,000 to 3,000 euros.

The bottom part of the table concerns two variables related to preferences for leisure and early or late retirement, and will be used in the empirical analysis to proxy variation in preferences that is normally unobserved. The first is the answer to the question "To what extent do you agree with the statement *I would work even if the money is not needed*, on a scale from 1 (strongly disagree) to 7 (fully agree)." The second is to construct a proxy for planned (for those who did not yet retire) or realized (for those who retired) retirement behavior. We asked respondents to construct the sequence that corresponds as much as possible to their actual behavior or their current plans. For each two years age category 55-56, ..., 67-68, 69-plus, we asked them to indicate their main labor market status, choosing among full-time work, part-time work, or (fully) retired. See Appendix Figure 11 for the exact question and Appendix Table 8 for the most commonly reported sequences. In the model we will use a dummy "early retirement" defined as 1 if for the age categories 55-56, ..., 61-62, the respondent chooses "retired" at least once; for 16.89% of the sample, this dummy has value 1.

Table 3 presents choice fractions for competing retirement scenarios in the stated preference questions. Respondents more often choose partial retirement than early or late retirement, demonstrating a preference for a smooth life-cycle profile of leisure and consumption. When the partial retirement option is omitted, slightly more of those who first chose partial retirement now choose early rather than late retirement. This suggests that partial retirement might have a (small) positive effect on total labor supply. The size of this effect depends on the retirement age – At later retirement ages, partial retirement becomes a more attractive alternative to full retirement than to full-time work, increasing total labor supply more at those ages. For example, when choosing among scenarios of early retirement at age 65 and late retirement at age 70 (or 69, if partial retirement is for four instead of five years), 41.23% chose early retirement and 18.31% chose late retirement when respondents are provided with the partial retirement option, whereas 64.75% chose early retirement and 35.24% chose late retirement when they did not have the partial retirement option. It suggests that partial retirement can be an effective policy option to stimulate labor participation at older ages.

Table 2: Sample composition

| Attribute | Percent |
|---|---|
| Age | |
| 40-49 years old | 19.52 |
| 50-59 years old | 24.81 |
| 60-69 years old | 32.26 |
| 70 years old or older | 23.41 |
| Gender | |
| Male | 52.09 |
| Education | |
| Has higher vocational or academic education | 34.98 |
| Marital status | |
| Married or living with partner | 72.69 |
| Employment status | |
| Working for an employer | 38.38 |
| Retired | 35.32 |
| Working self-employed | 5.91 |
| Unemployed | 3.40 |
| Fully or partially disabled | 4.95 |
| Homemaker | 8.04 |
| Other | 4.00 |
| Home ownership | |
| Owner | 75.19 |
| Last monthly net labor income in euros | |
| 0 | 5.06 |
| 1-1000 | 20.60 |
| 1001-2000 | 39.75 |
| 2001-3000 | 26.48 |
| 3001 or more | 8.11 |
| Would work even if money was not needed | |
| Strongly disagree | 22.89 |
| Disagree | 21.06 |
| Somewhat disagree | 7.52 |
| Not agree, not disagree | 16.24 |
| Somewhat agree | 14.72 |
| Agree | 13.21 |
| Totally agree | 4.36 |
| Experienced or expects early retirement | 16.89 |

Note: Based on the responses of 3,233 individuals.

Table 3: Competing retirement scenarios

| Scenario | Percent |
|---|---|
| E | 28.74 |
| P | 40.42 |
| L | 30.84 |
| | |
| E | 50.78 |
| L | 49.22 |
| | |
| E: P is 4 years | 27.62 |
| P: P is 4 years | 39.59 |
| L: P is 4 years | 32.78 |
| | |
| E: P is 5 years | 29.68 |
| P: P is 5 years | 41.10 |
| L: P is 5 years | 29.22 |
| | |
| E: Wage rate in P is same as in full-time work | 27.62 |
| P: Wage rate in P is same as in full-time work | 42.72 |
| L: Wage rate in P is same as in full-time work | 29.66 |
| | |
| E: Wage rate in P is 20% lower than in full-time work | 29.85 |
| P: Wage rate in P is 20% lower than in full-time work | 38.16 |
| L: Wage rate in P is 20% lower than in full-time work | 31.99 |
| | |
| P: 12 hrs/wk | 29.94 |
| P: 20 hrs/wk | 41.43 |
| P: 28 hrs/wk | 28.63 |
| | |
| P: 20 hrs/wk for 4 years | 50.66 |
| P: 20 and 10 hrs/wk in 2 successive periods of 2 years each | 49.34 |

Note: E: Early retirement. P: Partial retirement. L: Late retirement.

More people choose partial retirement if the duration of partial retirement is five instead of four years. When the wage rate in partial retirement is 20% lower than before (and partial retirement also implies a change to a less demanding job), partial retirement becomes less attractive. Partial retirement is more attractive if weekly hours worked is 20 than if it is 12 or 28. Whether hours worked is reduced in one or two steps hardly makes a difference.

## 5 Econometric model

Our model resembles the model used by Van Soest and Vonkova (2014). It is designed to use the stated preference questions to analyze the potential consequences of a higher retirement age, pension incentives, and partial retirement for the labor supply decisions of older individuals. In line with the stylized stated preference scenarios, it does not explicitly incorporate uncertainty about future health, unemployment, wage growth, or savings. We assume that the total utility,

$U_i^q$, of retirement trajectory $q$ for individual $i = 1, \ldots, n$ has the following form:

$$U_i^q = \sum_{t=60}^{100} \rho^{(t-60)} U_{it}^q \tag{1}$$

where $\rho$ is the discount factor. Approximate survival probabilities will be subsumed in $\rho$. $U_{it}^q$ is the utility at age $t = 60, \ldots, 100$. The time horizon is fixed at 100 years of age. $q$ is an early abrupt retirement trajectory (E), a partial retirement trajectory (P), or a late abrupt retirement trajectory (L). In all trajectories, the agent is working full-time at age 60. At later ages $t$, leisure $l_{it}^q$ and net income $y_{it}^q$ vary across trajectories.

Within period utility is specified as follows:

$$U_{it}^q = \alpha_{it}^l \ln\left(l_{it}^q\right) + \alpha^y \ln\left(y_{it}^q\right) + \alpha^{ly} \ln\left(l_{it}^q\right) \ln\left(y_{it}^q\right) \tag{2}$$

$$\alpha_{it}^l = X_i \beta^l + \eta^l t + e_i^l \tag{3}$$

$$e_i^l \sim N\left(0, \sigma_l^2\right) \text{ and } e_i^l \text{ independent of } X_i \tag{4}$$

$$l_{it}^q = T - h_{it}^q \tag{5}$$

$T$ is the number of hours available for work and leisure in a working week and is a parameter to be estimated. $h_{it}^q$ denotes hours of paid work per week. At each age $t$, the person can work full-time ($h_{it}^q = 40$), can be partially retired ($h_{it}^q$ =10, 12, 20, or 28), or can be fully retired ($h_{it}^q = 0$).

During full retirement, net income $y_{it}^q$ is after tax pension income, replacing part of prere-tirement after tax earnings according to a replacement rate. Independent of individual characteristics, replacement rates vary by design of the trajectories. During partial retirement, $y_{it}^q$ consists of (part-time) earnings as well as (partial) pension income.

The preference parameters $\alpha_{it}^l$ and $\alpha^{ly}$ drive the marginal utility of leisure time for respondent $i$ at age $t$. $\alpha_{it}^l$ depends on observed characteristics $X_i$ such as age, gender and home ownership, and, through $e_i^l$, on respondent $i$'s unobserved characteristics. The effect of age $t$ is captured by $\eta^l t$. We expect $\eta^l > 0$, since respondents' valuation of leisure will typically increase with age due to, e.g., expected health deterioration. A nonzero parameter $\alpha^{ly}$ implies that the marginal utility of leisure also varies with income.

Together with $\alpha^{ly}$, the parameter $\alpha^y$ determines the marginal utility of income. Both parameters are treated as constants, to avoid multicollinearity and imprecise estimates.

Introducing errors terms $u_i^q$ as in a standard random utility model (McFadden, 1998), the model takes the following form:

$$V_i^q = U_i^q + u_i^q \tag{6}$$

$$u_i^q \sim \text{i.i.d. type I extreme value and independent of } X_i, e_i^l \tag{7}$$

$$F(u_i^q) = e^{-e^{-u_i^q}} \tag{8}$$

where $F$ denotes the cumulative distribution function.

The observed choice in question $Q$ is given by

$$C_i^Q = q \text{ if } V_i^q > V_i^p \text{ for all } p \neq q. \tag{9}$$

As described in Section 3, respondents choose among retirement trajectories in a minimum of three and maximum of eight questions.

Define $u_i^q - u_i^p \equiv u_i^{qp}$. The assumptions on $u_i^q$ imply that $u_i^{qp}$ has a standard logistic distribution and that the probability of choosing scenario $q$ among alternative scenarios $j$ in question

$Q$, given all individual and scenario characteristics and preference parameters (including the unobserved preference term $e_i^l$), is given by

$$P\left(C_i^Q = q \mid A_i, e_i^l\right) = \frac{e^{U_i^q}}{\sum_j e^{U_i^j}} \tag{10}$$

where $A_i = \{l_{it}^q, y_{it}^q, X_i, t, \beta^l, \eta^l\}$ is the set of all relevant individual and trajectory characteristics and parameters.

Model estimation is similar to estimation of a mixed logit or other random coefficient models as in, e.g., Revelt and Train (1998), using maximum simulated likelihood. The (unconditional) likelihood contribution for individual $i$ can be written as a one-dimensional integral over the unobserved heterogeneity $e_i^l$ of the product of the conditional probabilities of the observed outcomes $C_i^Q$:

$$L_i = \int_{-\infty}^{\infty} \prod_{Q=1}^{K(i)} P\left(C_i^Q = q \mid A_i, e_i^l\right) \frac{1}{\sigma_l} \phi\left(\frac{e_i^l}{\sigma_l}\right) de_i^l \tag{11}$$

where $K(i)$ is the number of questions answered by respondent $i$ (which varies from 3 to 8, due to the design of the survey). We approximate the integral using simulated values of the random coefficient $e_i^l$.[4]

## 6 Estimation results

Table 4 presents the estimation results. The first ten rows present the coefficients $\beta^l$ determining how the marginal utility of leisure varies with individual characteristics (through the random coefficient $\alpha_{it}^l$). Many of the $\beta^l$ parameters are significant, implying substantial observed heterogeneity with respect to leisure preferences. The large and significant estimate of the standard deviation of $e_i^l$ implies there is also substantial variation in preferences that is not captured by observed respondent characteristics.

The significant negative estimate of age at the time of the survey suggests that older respondents attach less utility to leisure. This could be a cohort effect, but it also might mean that older individuals more often realize the risk of not being able to meet their consumption needs in retirement and hence see the need to work longer. Men attach more value to income and less to leisure than women do, reflecting the fact that on average, Dutch men work more hours than women do. Higher educated respondents value leisure less than lower educated respondents, possibly since they have jobs that are more attractive (and spending time on them gives less disutility). Respondents with a partner attach more value to leisure than singles, possibly due to a desire for joint leisure activities. Respondents with more housing wealth derive more utility from leisure, possibly because they can better afford it. Those who had a health problem during the six months prior to the survey also attach more value to leisure, probably since they also expect health issues in the future, implying an increasing disutility of working longer.

The variable "would work even if money was not needed" can be seen as a proxy for a low disutility of work, or even a positive marginal utility of working at least a few hours, keeping income and other variables constant.[5] In line with what one would expect, individuals with a low disutility of work tend to prefer later retirement and have a lower marginal utility

[4] We use 50 draws per individual and Halton draws (Train, 2009). Standard errors etc. are based upon asymptotic results; see, e.g., Gouriéroux and Monfort (1990).

[5] See, e.g., Börsch-Supan and Schuth (2014), who argue that early retirement negatively affects social networks and cognitive functioning.

of leisure (keeping other variables constant). Finally, those who expect or experienced early retirement tend to choose scenarios with more leisure, corresponding to a higher marginal utility of leisure, showing a significant positive relation between revealed preferences ((planned) actual retirement) and stated preferences. This shows there is a significant positive relation between revealed preferences (planned retirement or actual retirement) and the stated choices in our stated preference experiment. It indicates that our stated choice questions have predictive value for actual choices, confirming the usefulness and relevance of the stated preference questions (cf. Michaud et al., 2020).

The significant positive estimate of $\eta^l$, the coefficient of "running age, age in the future period for which the contribution to lifetime is calculated, implies that respondents attach increasing utility to leisure at older ages, probably because they expect that health deterioration will increase the disutility of working. It could also be that a social norm or the expected labor market position of the partner or their reference group makes working at an older age less and less attractive.

The estimates of $\alpha^y$ and $\alpha^{ly}$ cannot be interpreted directly. They determine the shape of the within period utility function and (together with $\alpha^l_{it}$), drive the sensitivity of retirement decisions for financial incentives. The estimate of the discount factor $\rho$ is 0.91 with a standard error of only 0.006. This also captures the mortality rate since mortality is not explicitly taken into account.[6]

The estimate of $T$ suggests that available leisure time is about 10 hours in a typical 38 hours of working week in collective labor agreements in the Netherlands.

We evaluate model fit based on a comparison of the choice probabilities in the survey with the average of the probabilities predicted by the model for each individual. We consider only the questions asking to choose among early, partial and late retirement, asked three times changing the retirement ages in the retirement scenarios, since these questions are asked to all respondents; other questions are asked conditional on the choice of partial retirement in these three questions (Section 3). Model predictions are based on the estimation using all questions asked in the survey. Table 9 shows that the observed and predicted choice probabilities are fairly close to each other although partial retirement is underestimated by about 5 pp. This owes to the fact that we fit the model to data from all questions, which is apparently somewhat demanding; we choose to do so because this increases the efficiency of our estimates. When we use only the questions asking to choose among early, partial and late retirement in the estimation, the observed and predicted choices for partial retirement differ by 3.4 pp.

## 7 Simulations

We use the estimated model to simulate the effects of potential policy changes on retirement decisions, focusing on partial retirement. We first simulate the choice probabilities for early, late and partial retirement scenarios (of the same type in Figure 2) at various retirement ages as our benchmark. We then study how the choice probabilities change when the statutory retirement age is increased, when pension incentives or the wage during partial retirement change. The retirement scenarios considered in the simulations are based on the original experimental design described in Section 3, but replacement rates are adapted to the alternative retirement ages (to account for the total number of years of pension accrual and actuarial adjustments to pensions at those ages). As described in Section 3, three attributes of the retirement scenarios are randomized: the pension income, the wage rate during partial retirement, and the duration

[6] The probability to survive from age 65 to age 80 was 0.672 in 2013, giving an average mortality rate of 2.7%, so corrected for mortality, the estimated value of $\rho$ would be approximately 0.94.

Table 4: Estimation results

| Parameter | Estimate | Standard error | t value |
|---|---|---|---|
| $\beta^l$: constant | −9.114 | 0.614 | −14.833 |
| $\beta^l$: age | −1.129 | 0.112 | −10.087 |
| $\beta^l$: male | −0.267 | 0.024 | −11.319 |
| $\beta^l$: high education | −0.053 | 0.021 | −2.504 |
| $\beta^l$: household with no children | 0.027 | 0.032 | 0.840 |
| $\beta^l$: with partner | 0.081 | 0.023 | 3.531 |
| $\beta^l$: home owner | 0.067 | 0.026 | 2.628 |
| $\beta^l$: had a health problem in the last six months | 0.084 | 0.022 | 3.852 |
| $\beta^l$: would work even if money was not needed | −0.104 | 0.007 | −15.232 |
| $\beta^l$: experienced or expect early retirement | 0.314 | 0.033 | 9.599 |
| $\eta^l$ | 0.124 | 0.008 | 16.238 |
| $\sigma_l$ | 0.556 | 0.028 | 19.491 |
| T | 47.854 | 0.972 | 49.232 |
| $\alpha^y$ | −0.449 | 0.127 | −3.535 |
| $\alpha^{ly}$ | 0.351 | 0.027 | 13.063 |
| $\rho$ | 0.907 | 0.006 | 158.396 |

Note: Estimation is based on the responses of 3,233 individuals who participated in the survey.

of partial retirement. In each simulation, we pool individuals assigned to the regimes defined for these attributes, unless the simulation concerns changing a specific attribute. Furthermore, hours worked per week is 20 during partial retirement unless otherwise is stated. Simulated choice probabilities are averaged over the complete sample, and take into account observed and unobserved heterogeneity as well as optimization errors.

### Increasing the statutory retirement age

*Increasing the statutory retirement age reduces interest in late abrupt retirement and increases interest in early retirement, but hardly affects the (substantial) interest in partial retirement.*

Figure 3 shows simulated average probabilities of choosing early, partial and late retirement as a function of the age of abrupt retirement or the start of partial retirement: the first point on the left is a choice between abrupt (early) retirement at age 60 (with a low pension), partial retirement from age 60 to age 64 (or 63 if duration of partial retirement is 4 years) and full retirement thereafter, or abrupt (late) retirement at age 65 (or 64 if duration of partial retirement is 4 years). Moving along the horizontal axis gives the same probabilities if all these ages increase by 1 to 6 years. Hence, on the right-hand side, the choice is among abrupt early retirement at age 66, partial retirement from age 66 until age 70 (or 69), or abrupt retirement at age 71; the three choice probabilities always add up to 100%.

When the statutory retirement age increases, the probability of early retirement increases and the probability of late retirement falls. For example, increasing the retirement age from 61 to 63 increases the probability of early retirement from 20 to 30%. The probability of partial retirement, however, is always between 32 and 35%, demonstrating the potential of partial retirement schemes, particularly if full-time working becomes unattractive due to an increase of the statutory retirement age. Note that even if the age of partial or full retirement is raised to 66, about half of the respondents would still want to work after that age. This result is in line with Ameriks et al. (2020), who find a substantial interest in the US in working longer if jobs were flexible.

In the context of the life-cycle labor supply and retirement model of Rogerson and Wallenius (2013), Ameriks et al. (2020) demonstrate that those with a low intertemporal elasticity of substitution (IES) highly value the option of part-time work for a smooth life-cycle profile of leisure and consumption, while those with a high IES will often choose abrupt retirement. The strong interest in partial retirement suggests that there is a substantial group of individuals who in principle would prefer a smooth life-cycle profile of leisure, gradually reducing paid work hours and increasing hours spent on other activities (leisure, in our model) instead of abruptly changing from full-time paid work to full retirement. The probabilities to choose partial retirement are much larger than the fractions of workers who actually choose partial retirement Ameriks et al. (2020), pointing at other factors that hamper the combination of part-time work and partial retirement in practice. Such factors, not incorporated in our vignettes, could be, e.g., restrictions imposed by the employer, health issues and (partial) disability, or the role of the partner.

### Changing the characteristics of the partial retirement plan

*The interest in partial retirement would increase a lot if partial retirement would imply fewer hours of work, 12 instead of 20 per week. Partial retirement would become much less popular if it comes with a reduced wage rate.*

Figure 4 shows the choice probabilities for three different numbers of hours worked during partial retirement: 12, 20 or 28 hours. The differences in the choice probabilities are notable. At a low retirement age, partial retirement with 28 hours of work per week is an often chosen alternative for full retirement. At higher retirement ages, the situation reverses and working 28 hours is often not attractive, like full time work. At a high retirement age, partial retirement with a small part-time job is often chosen as a good alternative for early retirement.

Existing studies provide evidence that older workers who take a part-time job before they fully retire often work at a reduced hourly wage, due to a part-time wage penalty or to switching to a less demanding job (Gordon and Blinder 1980; Gustman and Steinmeier 1985; Ruhm 1990; Aaronson and French 2004; Rogerson and Wallenius 2009). Figure 5 shows simulated choice probabilities when hourly wages in partial retirement are the same as when working full-time prior to partial retirement, and when they are 20% lower or higher. The partial retirement option clearly becomes more attractive for a higher wage during partial retirement, irrespective of the retirement age. A reduction in the hourly wage mainly induces many individuals to choose to continue working full-time rather. On the other hand, an increase in the hourly wage rate (e.g., induced by a subsidy of gradual retirement) induces many people who otherwise would have stopped working early to participate in partial retirement.[7]

### Financial incentives

*The interest in partial retirement is not sensitive for the overall generosity of pensions, but does increase with the rewards for working longer (the accruals).*

Figure 6 shows simulated choice probabilities when pension accruals are based on an accrual rate of 2.05% (the benchmark), 1.85%, or 2.25%, implying replacement rates that are 10 pp lower or higher than the replacement rates implied by the benchmark accrual rate of 2.05% (Table 5). The effects we find are in line with the notion that leisure is a normal good: a higher replacement rate implies more early retirement and less late retirement. The probability to choose partial retirement does not change much. The effects are sizable compared to the

[7] Additional simulations show that the probability to choose partial retirement is not sensitive to the duration of partial retirement or the number of partial retirement steps. Results are available upon request.

existing literature. For example, for the US, Van der Klaauw and Wolpin (2008) find that a 25% reduction in Social Security benefits reduces labor participation of both husbands and wives aged 51-61 to a limited extent but increases labor participation of individuals aged 62-69. Delavande and Rohwedder (2017) find that individuals would expect to work longer and reduce spending if their Social Security benefits were cut by 30%. For Ukraine, Danzer (2013) found that a 10% rise in the minimum pension level increases the probability of retiring by 1.2% for women and 1.9% for men. In their stated preferences study for the Netherlands, Van Soest and Vonkova (2014) also found a substantial income effect: reducing replacement rates by 10 percentage points would increase the average retirement age by 3.24 months.

Figure 7 shows what happens if rewards for later retirement are based on higher or lower actuarial factors than the actuarially fair ones used in practice. Appendix Figure 12 presents all actuarial factors. The yellow line represents benchmark actuarial factors and underlie the replacement rates that give actuarially fair rewards for later retirement. The flatter red line and steeper green line underlie the replacement rates that give less and more than actuarially fair rewards for later retirement, respectively. With actuarially fair benchmark accruals, the replacement rates increase, on average, by 8% for each year retirement is delayed from age 65 to 70. In the low and high accruals scenarios, this increase is 6% and 10%, respectively (Table 5). At earlier retirement ages the increase in the replacement rates for delaying retirement is smaller (actuarial factors is nonlinear across retirement ages in Figure 12).

Figure 7 demonstrates that higher rewards for later retirement substantially reduce the probability to choose early retirement. This is in line with earlier studies such as Van Soest and Vonkova (2014), who found that the retirement age would fall by 9.72 months if the rewards for retiring later would be halved. Particularly if the statutory retirement age is high, higher accruals increase the probability of partial retirement more than the probability of late (abrupt) retirement. Apparently, the higher rewards are not enough to make people work full-time until high age, but they do convince people to continue working part-time. To the best of our knowledge this is the first evidence on the price effect of pensions on the partial retirement decision.

### The added value of partial retirement

*Facilitating partial retirement not only increases labor force participation but also has the potential to increase total labor supply.*

Figure 8 shows how the choice probabilities for early and late retirement change when the partial retirement option is omitted. Choice probabilities for early and late retirement both increase at every retirement age, and the increase is always larger for early retirement than for late retirement. Since in this simulation partial retirement always means working half-time, this suggests that introducing the option of partial retirement has a positive impact on total labor supply. This positive effect is larger at later statutory retirement. This is plausible: since the propensity of early retirement increases at later statutory retirement ages, partial retirement more often becomes an attractive alternative to early retirement.

This result is in line with Ameriks et al. (2020) who find that older individuals in the US would work longer if they had opportunities to work in jobs that allow them to choose hours worked per week or weeks worked per year. For Germany, Huber et al. (2016), Berg et al. (2020), and Haan and Tolan (2019) also conclude that encouraging partial retirement can lead to positive labor supply effects. These findings differ from those of several other studies. Börsch-Supan et al. (2018) exploited cross-country variation in pension systems with respect to whether they adopted partial retirement schemes, to explain differences in annual labor force participation and work hours between these countries. Van Soest and Vonkova (2014)

and Elsayed et al. (2018) conduct stated choice experiments including partial retirement in the Netherlands. These studies find that partial retirement reduces total labor supply. A possible explanation is that the aggregate labor supply effect depends on the details of the partial, early and late scenarios that individuals can choose.

### Subsidizing partial retirement

*Subsidizing gradual retirement arrangements can make gradual retirement substantially more attractive and has a positive effect on total labor supply.*

Until now, we essentially assumed that partial retirement was rewarded in an actuarially neutral manner. Individuals have maximum flexibility and pay a fair price for retiring partially. Recently, however, labor unions and employers introduced subsidized partial retirement schemes ("Generation pact") in collective labor agreements; see, e.g., Rutten et al. (2023) for details on how this is implemented in parts of the public sector. At any age from, for example, five years before the state pension eligibility age until this age, these schemes allow a worker to reduce work hours with a less than proportional decrease in salary and no reduction in pension accruals. The schemes do not allow to claim pension rights during partial retirement. Sector agreements differ in how much weekly hours can be reduced and how much they subsidize the salary and often offer multiple options. Here we consider one simple example: employees can work 60% of their former hours and earn 70% of their former wage, but still accrue pension rights over 100% of their original (full-time) wage.

Figure 9 presents the choice probabilities for this arrangement, comparing them to the benchmark of the standard actuarially neutral partial pension arrangement without pension during partial retirement (so 60% of hours, earnings, and pension accruals during partial retirement). We consider decisions at each age from 62 to 65, each lasting until age 67 (the state pension eligibility age in 2024). Therefore, duration of partial retirement depends on the age partial retirement starts. The figure shows that the subsidy make partial retirement substantially more attractive, particularly if offered at an early stage so that individuals can benefit for a longer period (five years).

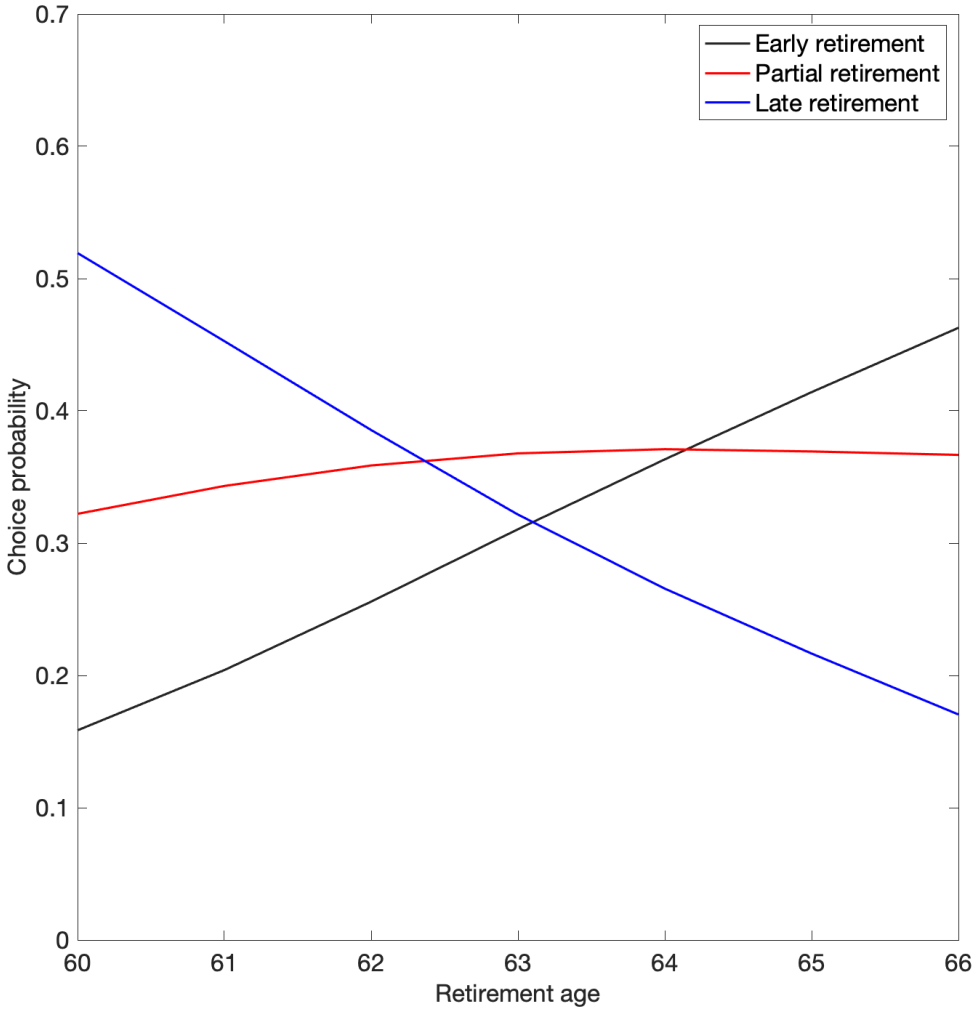


Figure 3: Probabilities of choosing among early, partial and late retirement at given ages.

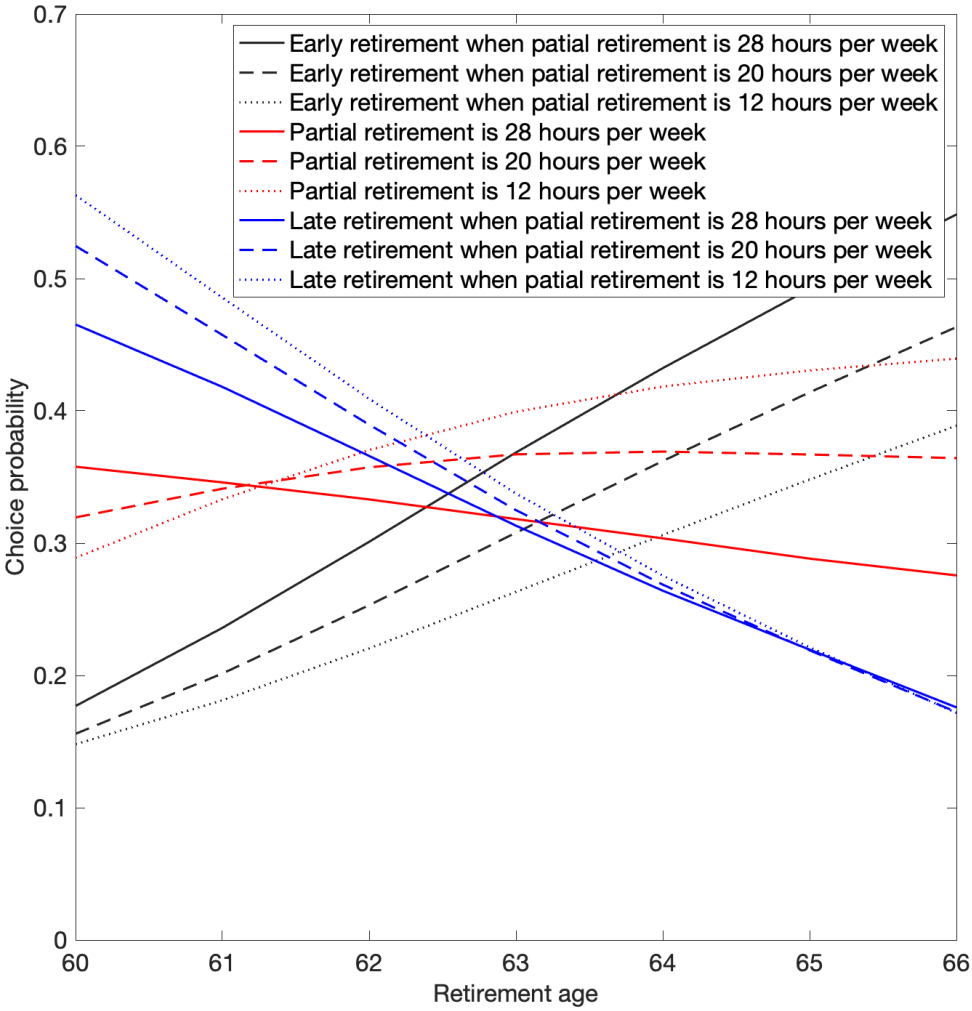


Figure 4: Probabilities of choosing among early, partial and late retirement at given ages, distinguishing among partial retirement with 28, 20 and 12 hours per week.

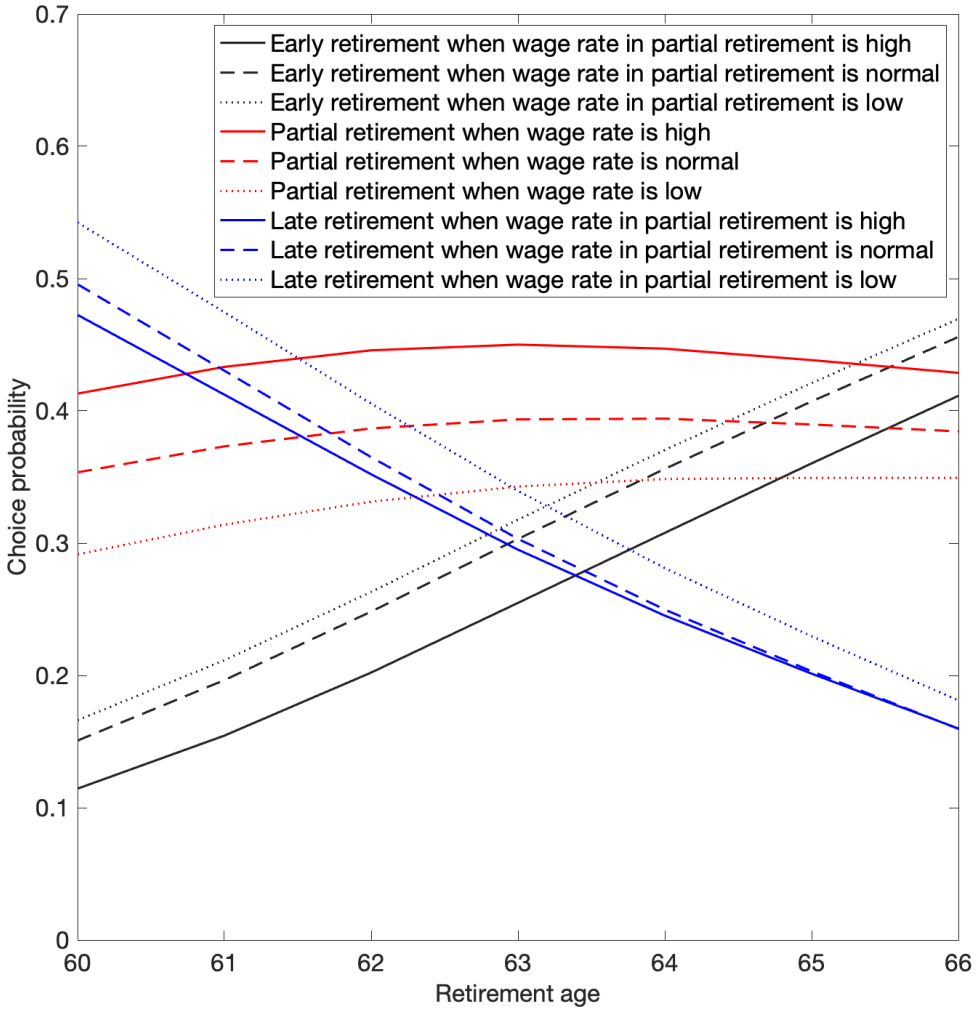


Figure 5: Probabilities of choosing among early, partial and late retirement at given ages, when the wage rate during partial retirement changes.

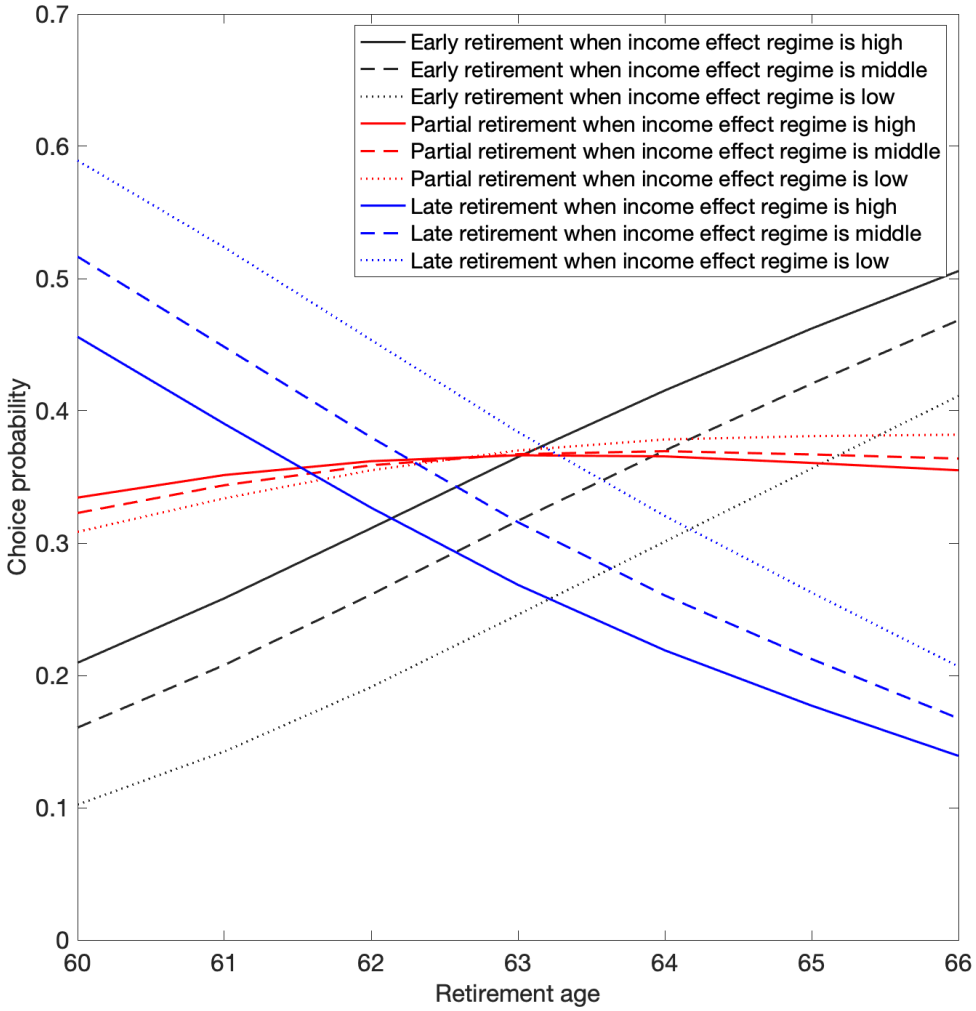


Figure 6: Probabilities of choosing among early, partial and late retirement at given ages, when pension benefit levels change irrespective of the retirement age.

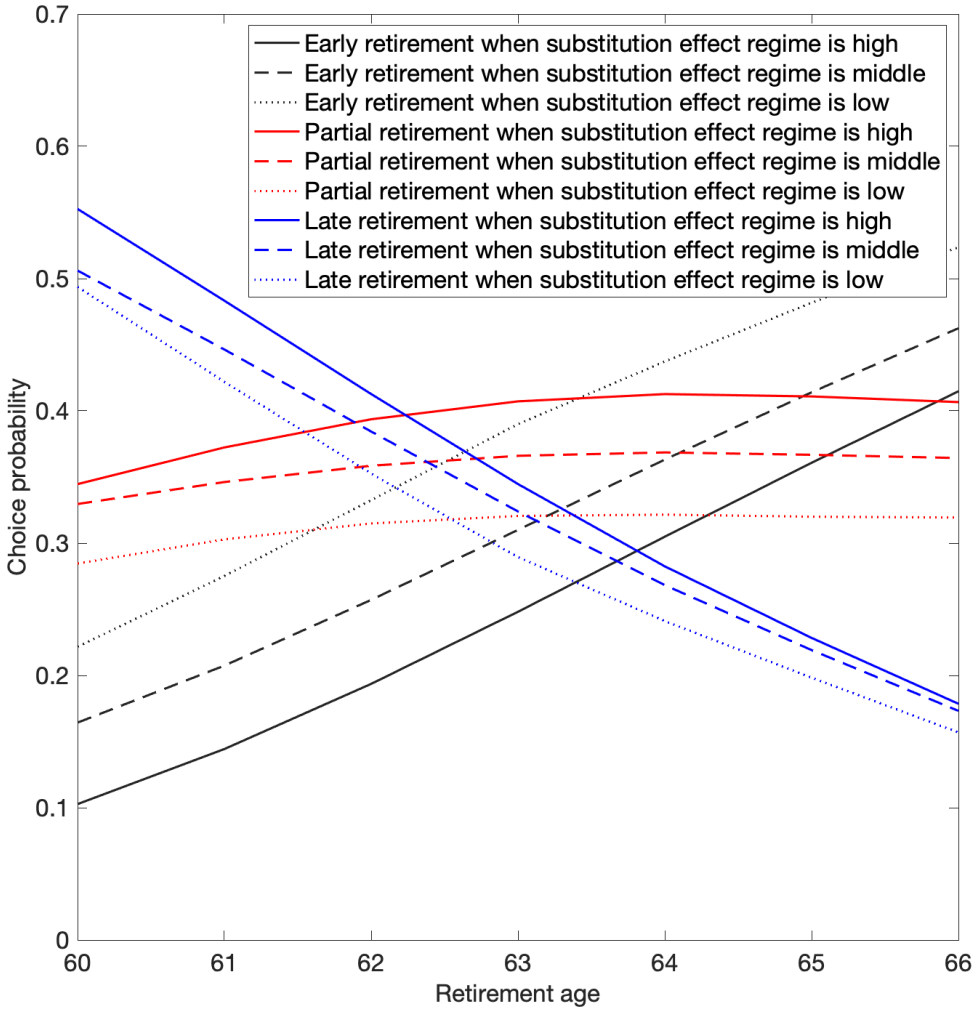


Figure 7: Probabilities of choosing among early, partial and late retirement at given ages, when the pension benefit accrual induced by delaying retirement changes.

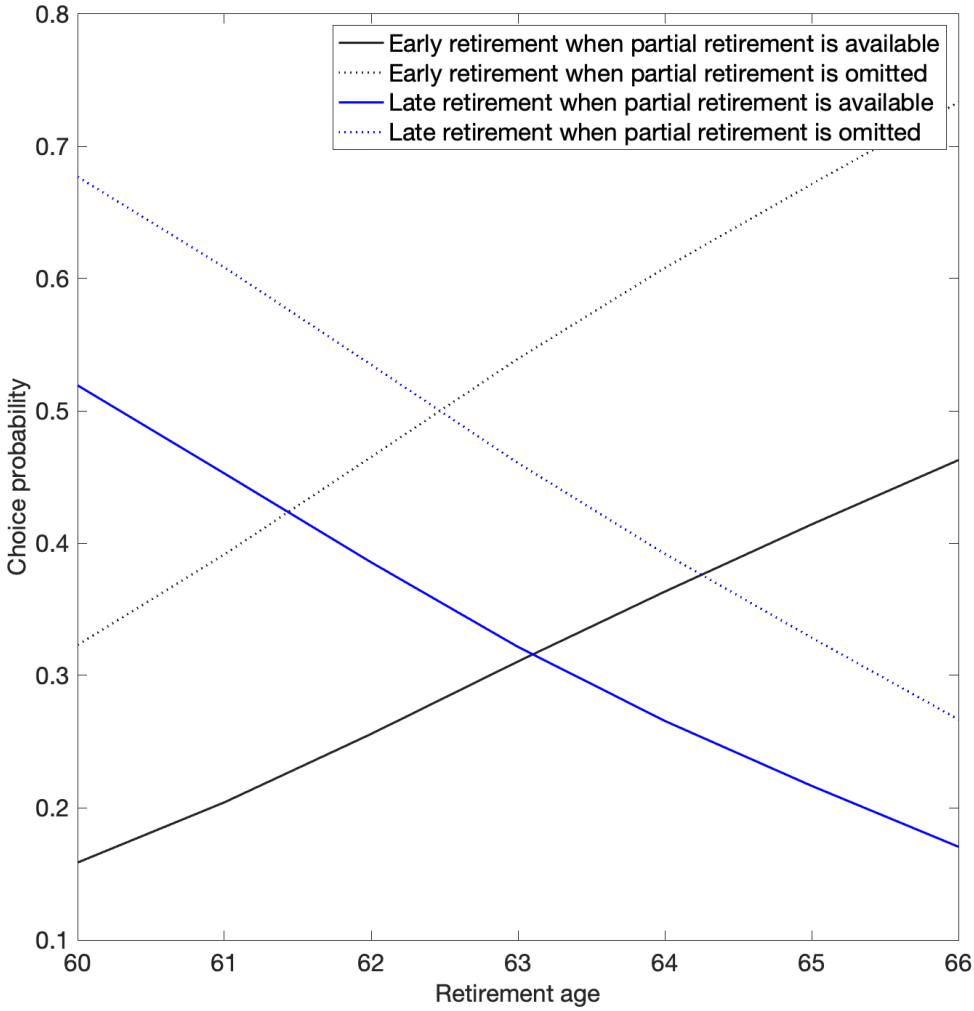


Figure 8: The effect of introducing partial retirement on total labor supply.

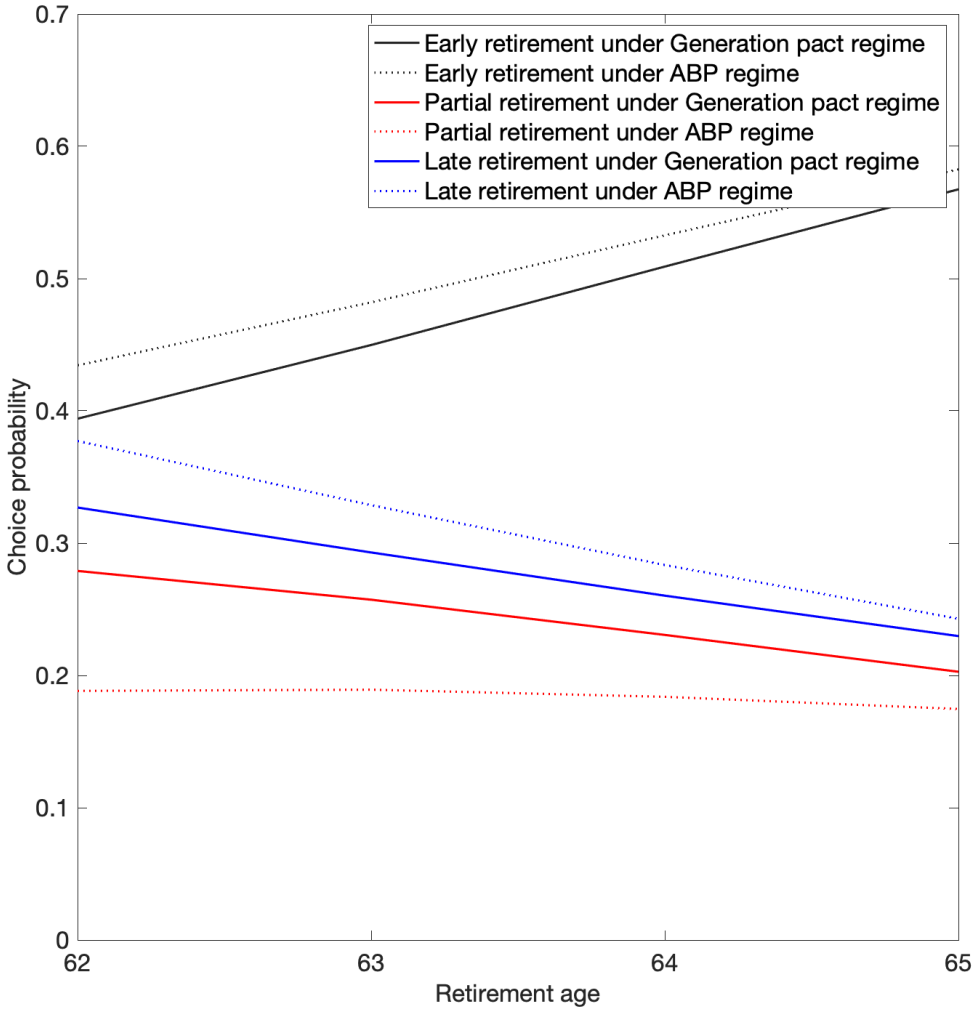


Figure 9: Generation pact: 60% work, 70% compensation and 100% pension accrual.

# 8 Conclusion

Partial retirement seems an attractive way to gradually withdraw from the labor market, avoiding the sudden change in time use and activities of abruptly switching from full-time work to no paid work at all. This is in line with standard models of labor supply in which individuals prefer to smooth leisure and consumption over the life cycle. In practice, however, partial retirement is less common than one might expect on the basis of preferences alone, due to demand side restrictions or institutional constraints. In this paper, we have followed several recent papers by studying partial retirement using stated choice survey questions, aiming at an analysis of labor supply preferences only, purged from the restrictions that someones actual labor market position may impose. Our questions provide a more detailed picture of partial retirement than existing studies by considering several properties of the partial retirement option, such as the starting and ending age and the hourly wage rate when working part-time. We use vignette questions asking respondents to make choices based upon their own preferences but for hypothetical individuals, making it possible to ask respondents to make choices that are not realistic in their own situation. We account for the standard actuarial rules of pension systems, making the trade-offs between income and leisure as realistic as possible.

We randomly vary retirement plan characteristics in several questions across respondents, generating rich variation in choice sets and stated choices. We exploit this variation to obtain accurate model estimates and conduct credible counterfactual policy simulations. The labor supply preferences that we estimate correlate in plausible ways with peoples' actual or predicted retirement plans and with a subjective question on whether they value work just for money or for its intrinsic value, lending credibility to our stated choice data.

We find substantial interest in partial retirement, with more than one third of the respondents choosing partial retirement rather than actuarially fair early or late abrupt retirement trajectories. The probability to choose partial retirement hardly varies with the statutory retirement age. This suggests a strong preference to smooth leisure and consumption over the life cycle in line with the predictions of standard labor supply models. The fact that stated interest in partial retirement is stronger than the actual prevalence of partial retirement confirms that actual partial retirement decisions are often hampered by other factors, like demand side restrictions.

If individuals do not have the partial retirement option, early abrupt retirement more often becomes the best alternative than late retirement, demonstrating the potential of partial retirement as a policy instrument to stimulate older individuals remain in the labor force. Policy makers can harness this potential as they consider increasing the statutory retirement age to keep pension systems sustainable because in fact we show that this potential is more pronounced when the statutory retirement age is increased.

Responses to pension incentives, for both abrupt and partial retirement, are sizable compared to those found in earlier studies, considering that the sizes of the incentives we consider are much smaller. This is important because small pension incentives are much more within the reach of policy makers who have to carefully consider pension interventions.

We disentangle wealth and price effects of pensions at the intensive and extensive margin at various retirement ages. We find that the partial retirement decision is much less sensitive to the wealth effect of pensions than are the early or late abrupt retirement decisions. On the other hand, partial retirement is sensitive to the price effect of pensions. More importantly, the partial retirement decision strongly depends on the specific financial incentives for retiring partially. Interest in partial retirement would fall substantially if partial retirement came with a substantially lower wage (and a less challenging job). Accordingly, the potential interest in partial retirement increases a lot if partial retirement is subsidized and rewarded in a more than

actuarially fair manner.

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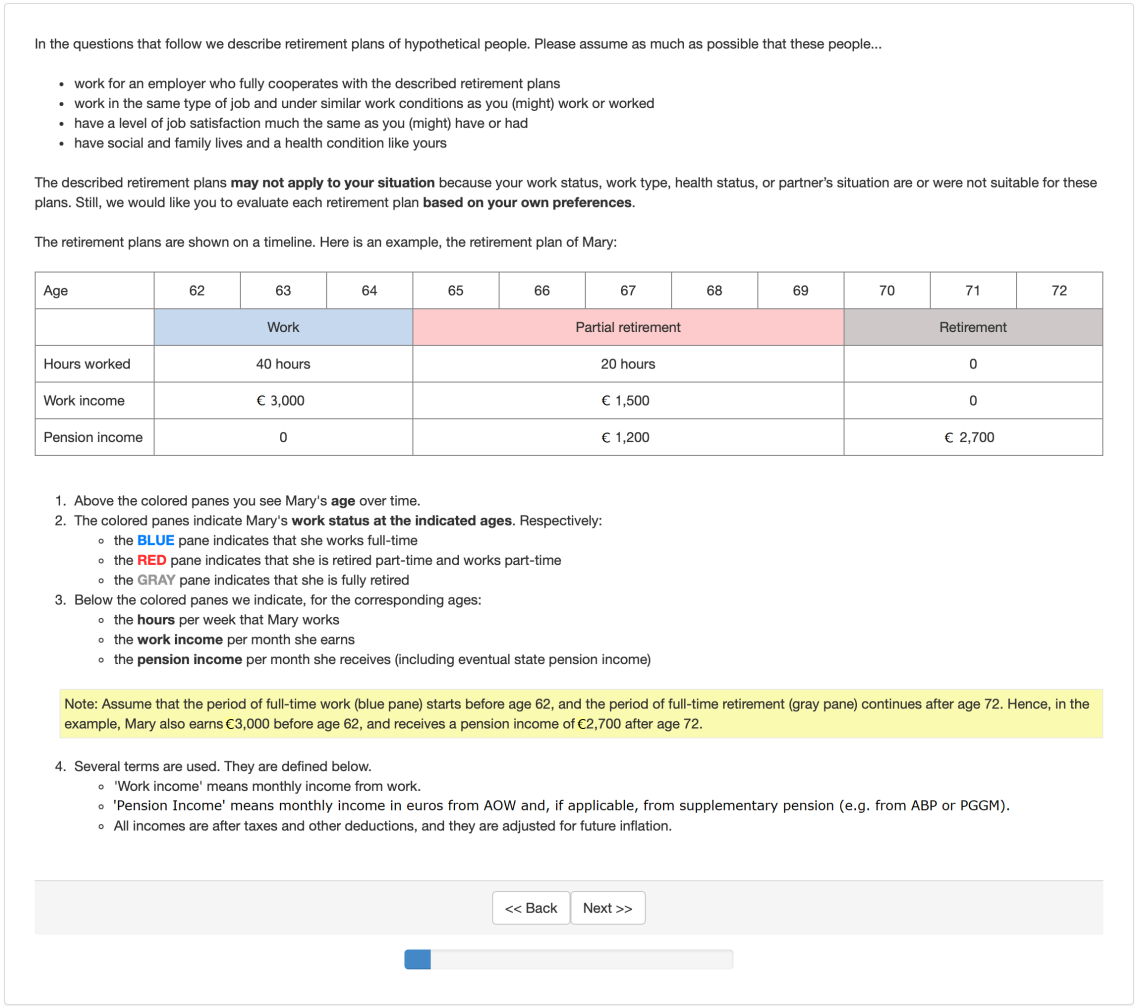
# Appendix



In the questions that follow we describe retirement plans of hypothetical people. Please assume as much as possible that these people...

- work for an employer who fully cooperates with the described retirement plans
- work in the same type of job and under similar work conditions as you (might) work or worked
- have a level of job satisfaction much the same as you (might) have or had
- have social and family lives and a health condition like yours

The described retirement plans **may not apply to your situation** because your work status, work type, health status, or partner's situation are or were not suitable for these plans. Still, we would like you to evaluate each retirement plan **based on your own preferences**.

The retirement plans are shown on a timeline. Here is an example, the retirement plan of Mary:

| Age | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Work | | | Partial retirement | | | | | Retirement | | |
| Hours worked | 40 hours | | | 20 hours | | | | | 0 | | |
| Work income | € 3,000 | | | € 1,500 | | | | | 0 | | |
| Pension income | 0 | | | € 1,200 | | | | | € 2,700 | | |

1. Above the colored panes you see Mary's **age** over time.
2. The colored panes indicate Mary's **work status at the indicated ages**. Respectively:
   - the **BLUE** pane indicates that she works full-time
   - the **RED** pane indicates that she is retired part-time and works part-time
   - the **GRAY** pane indicates that she is fully retired
3. Below the colored panes we indicate, for the corresponding ages:
   - the **hours** per week that Mary works
   - the **work income** per month she earns
   - the **pension income** per month she receives (including eventual state pension income)

Note: Assume that the period of full-time work (blue pane) starts before age 62, and the period of full-time retirement (gray pane) continues after age 72. Hence, in the example, Mary also earns €3,000 before age 62, and receives a pension income of €2,700 after age 72.

4. Several terms are used. They are defined below.
   - 'Work income' means monthly income from work.
   - 'Pension Income' means monthly income in euros from AOW and, if applicable, from supplementary pension (e.g. from ABP or PGGM).
   - All incomes are after taxes and other deductions, and they are adjusted for future inflation.

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Figure 10: Instructions page.

Table 5: Replacement rates in competing retirement scenarios

| Retirement age regime | Type of retirement | Full or partial retirement age | Replacement rate during partial retirement | Replacement rate during full retirement |
|---|---|---|---|---|
| 65 | E | 65 | | 0.60/0.70/0.80 |
| | | | | 0.60/0.70/0.80 |
| | | | | 0.60/0.70/0.80 |
| | P | 65-69 | 0.20/0.30/0.40 | 0.75/0.85/0.95 |
| | | | 0.25/0.35/0.45 | 0.80/0.90/1.00 |
| | | | 0.30/0.40/0.50 | 0.85/0.95/1.05 |
| | L | 70 | | 0.90/1.00/1.10 |
| | | | | 1.00/1.10/1.20 |
| | | | | 1.10/1.20/1.30 |
| 63 | E | 63 | | 0.50/0.60/0.70 |
| | | | | 0.50/0.60/0.70 |
| | | | | 0.50/0.60/0.70 |
| | P | 63-67 | 0.15/0.25/0.35 | 0.60/0.70/0.80 |
| | | | 0.20/0.30/0.40 | 0.65/0.75/0.85 |
| | | | 0.25/0.35/0.45 | 0.70/0.80/0.90 |
| | L | 68 | | 0.70/0.80/0.90 |
| | | | | 0.80/0.90/1.00 |
| | | | | 0.90/1.00/1.10 |
| 61 | E | 61 | | 0.40/0.50/0.60 |
| | | | | 0.40/0.50/0.60 |
| | | | | 0.40/0.50/0.60 |
| | P | 61-65 | 0.10/0.20/0.30 | 0.45/0.55/0.65 |
| | | | 0.15/0.25/0.35 | 0.50/0.60/0.70 |
| | | | 0.20/0.30/0.40 | 0.55/0.65/0.75 |
| | L | 66 | | 0.50/0.60/0.70 |
| | | | | 0.60/0.70/0.80 |
| | | | | 0.70/0.80/0.90 |

Notes: 1. E, P, L denote early, partial, and late retirement, respectively. 2. The first, second, and third rows refer to the low, middle and high accrual regimes, respectively. The first, second, and third columns refer to the low, middle and high income regimes, respectively. 3. For pension income (i.e., the replacement rate), one of nine regimes is assigned, with each regime characterized by low, middle or high replacement rates in all three scenarios, and by low, middle, or high accruals (i.e., rewards for retiring later). 4. The replacement rates for the short duration regime where partial retirement is 4 instead of 5 years, are 5 pp lower when fully retired in the scenario of partial retirement, and 10 pp lower when fully retired in the scenario of late retirement (due to working part-time or full-time one year less). 5. In each question, three attributes of the scenarios were randomized: pension income, the wage rate during partial retirement, and the duration of partial retirement. The order in which the first and the last retirement scenarios were presented was also randomized.

Table 6: Replacement rates in competing partial retirement scenarios with different numbers of hours worked per week during partial retirement

| Retirement age regime | Partial retirement age | Hours worked during partial retirement | Replacement rate during partial retirement | Replacement rate during full retirement |
|---|---|---|---|---|
| 65 | 65-69 | 12 | 0.45/0.55/0.65 | 0.75/0.85/0.95 |
| | 65-69 | 20 | 0.25/0.35/0.45 | 0.80/0.90/1.00 |
| | 65-69 | 28 | 0.05/0.15/0.25 | 0.85/0.95/1.05 |
| 63 | 63-67 | 12 | 0.40/0.50/0.60 | 0.60/0.70/0.80 |
| | 63-67 | 20 | 0.20/0.30/0.40 | 0.65/0.75/0.85 |
| | 63-67 | 28 | 0.00/0.10/0.20 | 0.70/0.80/0.90 |
| 61 | 61-65 | 12 | 0.35/0.45/0.55 | 0.45/0.55/0.65 |
| | 61-65 | 20 | 0.15/0.25/0.35 | 0.50/0.60/0.70 |
| | 61-65 | 28 | 0.00/0.05/0.15 | 0.55/0.65/0.75 |

Notes: 1. Considering the replacement rates column-wise, the first, second, and third columns refer, respectively, to the low, middle and high income effect regimes. 2. The replacement rates for the short duration regime where partial retirement is four years, instead of five years here, are 5 pp lower when fully retired in scenarios of partial retirement, and 10 pp lower when fully retired in scenarios of late retirement, due to working, respectively, part-time and full-time one year less.

Table 7: Replacement rates in competing partial retirement scenarios where hours are reduced in one or two steps during partial retirement

| Retirement age regime | Partial retirement age | Partial retirement in one or two steps | Replacement rate during the first step of partial retirement | Replacement rate during the second step of partial retirement | Replacement rate during full retirement |
|---|---|---|---|---|---|
| 65 | 65-68 | 1 | 0.25/0.35/0.45 | | 0.75/0.85/0.95 |
| | 65-68 | 2 | 0.25/0.35/0.45 | 0.50/0.60/0.70 | 0.70/0.80/0.90 |
| 63 | 63-66 | 1 | 0.20/0.30/0.40 | | 0.60/0.70/0.80 |
| | 63-66 | 2 | 0.20/0.30/0.40 | 0.45/0.55/0.65 | 0.55/0.65/0.75 |
| 61 | 61-64 | 1 | 0.15/0.25/0.35 | | 0.45/0.55/0.65 |
| | 61-64 | 2 | 0.15/0.25/0.35 | 0.40/0.50/0.60 | 0.40/0.50/0.60 |

Notes: Considering the replacement rates column-wise, the first, second and third columns refer, respectively, to the low, middle and high income effect regimes.

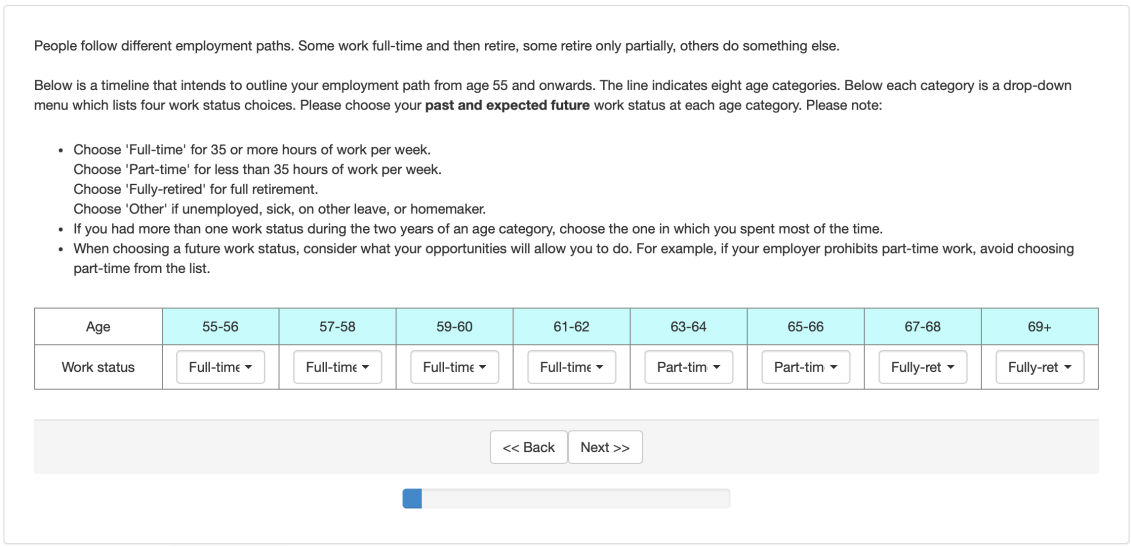


Figure 11: Question asking to outline past and expected future work status from age 55 onwards.

Table 8: Most common self-reported retirement sequences

| Sequence | Percent | Sequence | Percent |
|---|---|---|---|
| 22222333 | 6.68 | 11111111 | 1.04 |
| 22222233 | 6.30 | 13333333 | 1.04 |
| 44444444 | 5.35 | 11223333 | 0.98 |
| 11111133 | 4.35 | 22333333 | 0.91 |
| 44444333 | 3.97 | 11123333 | 0.88 |
| 11111333 | 3.87 | 11111122 | 0.85 |
| 22223333 | 3.75 | 11122223 | 0.82 |
| 22233333 | 3.75 | 11222233 | 0.72 |
| 11113333 | 3.65 | 23333333 | 0.72 |
| 11133333 | 2.83 | 11111222 | 0.66 |
| 33333333 | 2.68 | 11112223 | 0.66 |
| 11122333 | 2.61 | 11111112 | 0.63 |
| 11112233 | 2.52 | 11144333 | 0.63 |
| 44444433 | 2.49 | 11444333 | 0.63 |
| 22222223 | 2.24 | 12223333 | 0.60 |
| 11111233 | 2.08 | 12222333 | 0.57 |
| 11122233 | 1.95 | 22244333 | 0.57 |
| 11112333 | 1.89 | 22444333 | 0.50 |
| 11111113 | 1.67 | 11233333 | 0.41 |
| 11111123 | 1.48 | 12233333 | 0.41 |
| 11333333 | 1.35 | 12222233 | 0.35 |
| 11111223 | 1.32 | 22224333 | 0.35 |
| 22222222 | 1.32 | 44444443 | 0.35 |
| 11222333 | 1.10 | 11114333 | 0.31 |

Notes: 1. 1: Full-time work, 2: Part-time work, 3: Retired; 4: Other. 2. Retirement sequences are ranked according to the percentage of 3,176 respondents who reported the sequence. 3. The eight elements of a given sequence refer to the self-reported work status at eight age categories given by 55-56, 57-58, 59-60, 61-62, 63-64, 65-66, 67-68, and 69 plus.

Table 9: Model fit

| Retirement age regime | Type of retirement | Full or partial retirement age | Percent of choices in the survey | Percent of choices predicted by the model |
|---|---|---|---|---|
| 61 | E | 61 | 19.05 | 19.82 |
| | P | 61-65 | 37.70 | 33.37 |
| | L | 66 | 43.24 | 46.79 |
| 63 | E | 63 | 25.95 | 29.97 |
| | P | 63-67 | 43.08 | 34.95 |
| | L | 68 | 30.96 | 35.07 |
| 65 | E | 65 | 41.23 | 40.96 |
| | P | 65-69 | 40.45 | 36.66 |
| | L | 70 | 18.31 | 22.36 |

Note: E: Early retirement. P: Partial retirement. L: Late retirement.

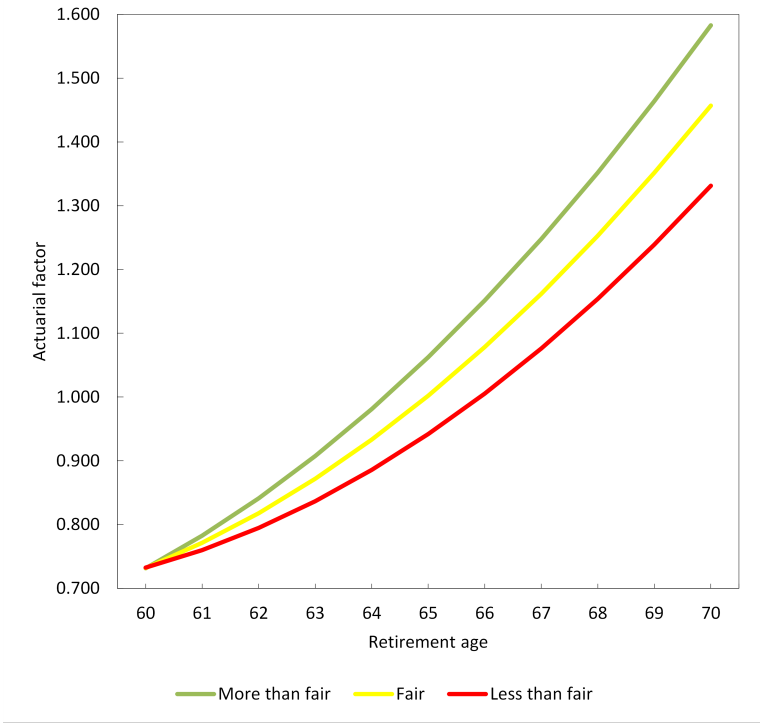


Figure 12: Actuarial factors that adjust pension rights due to claiming at different retirement ages.